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Applicant:	Roy Mathieu
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Examiner:	Nathan W. Ha
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CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)

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Eileen MacKenzie
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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE

Sir:

This responds to the Office Action mailed October 1, 2003 in the above-identified application. For the following reasons, reconsideration and allowance of the application are respectfully requested.

Claims 1-4 are pending for examination, with claims 1 and 4 being independent claims.

Rejections Under 35 U.S.C. §103

Claims 1-4 stand rejected under 35 U.S.C. §103(a) as purportedly being unpatentable over Applicant's admitted prior art (AAPA) in view of WO 95/04374 to Whitney. Applicant respectfully traverses this rejection.

A. Discussion of Applicant's Admitted Prior Art (AAPA)

AAPA discloses various configurations of a high voltage power component, delimited at its periphery by an insulating wall 2, that attempt to a) prevent leakage currents in the device (Fig. 1 and 2B) and b) increase the cathode breakdown voltage (Fig. 3). To avoid leakage

currents, it is known to use a "stop-channel" region formed of a heavily-doped N+ area 10 between the external periphery of region 6 and the internal periphery of wall 2, the area 10 forming a ring that extends over the entire periphery of the component (see Fig. 2B). However, as shown in Fig. 2B, the presence of stop-channel region 10 tends to cause a deformation of the equipotential surfaces which lowers the breakdown voltage of the device (see AAPA pages 2 and 3). AAPA also discloses using floating field plates above the device and below track L and arranged such that they are capacitively coupled with the silicon to allow for a high breakdown voltage. However this solution has the disadvantage of being strongly dependent on the quality of the oxides and may require manufacturing equipment that is not readily available in power component manufacturing technologies. Another solution places a field plate 15 in contact with insulating wall 2 and extending inwards from the wall. However, this structure implies an extension of the field plate beyond the component well which adversely affects the breakdown voltage of the well, and in some cases may not work at all (see AAPA page 4).

B. The Office Action Inappropriately Combines Different Features of AAPA

As stated previously in Applicant's Response After Final, mailed June 12, 2003, AAPA does not teach or suggest that any of the solutions illustrated in Fig. 3 may be used with a device having the N+ region of Fig. 2B. Figs. 2B and 3 illustrate different solutions for solving different problems. Applicant respectfully submits that the Office Action inappropriately combines distinct features of AAPA that are not taught by Applicant's specification. In particular, the assertion on page 2 of the Office Action is that AAPA teaches, among other things, a third region 10 of the first conductivity type, and also teaches a field plate 13. Yet, the region 10 is illustrated in Figure 2B of AAPA, and the field plate 13 is illustrated in Figure 3 of AAPA. These features are not taught as being combined in AAPA, but rather, belong to distinct embodiments of AAPA. The Office Action has provided no motivation for combining these distinct features. Furthermore, the Office Action has provided no explanation of how the features could be practically combined. For at least these reasons, the asserted combination of AAPA with Whitney is improper. Accordingly, Applicant respectfully requests that the rejection of claims 1-4 under 35 U.S.C. §103(a) be withdrawn.

C. Discussion of Whitney

Whitney teaches a reverse field plate to be used in conjunction with a junction terminating structure. Figure 2 illustrates a cross-section of a portion of an integrated circuit 20 having an N^- type substrate 21 (page 7, lines 30-33). A PN junction 28 is formed in the substrate (page 7, lines 36-37), as is a graded junction termination 27 (page 7, line 38-page 8, line 3). A field plate 31 having a first portion 34 and a second portion 36 is also provided (page 9, lines 31-34). The first portion 34 is joined to N^- type substrate 21 by N^+ layer 35 (page 10, lines 4-5). The second portion 36 extends over the length of the graded junction 27 (page 9, lines 36-38).

D. Claim1 Distinguishes Over the Combination of Applicant's Prior Art and Whitney

Claim 1 is directed to a high voltage device formed in a region of a silicon substrate of a first conductivity type delimited by a wall of a second conductivity type. The high voltage device comprises a lower surface comprising a first region of the second conductivity type connected to the wall, an upper surface comprising a second region of the second conductivity type, a high voltage being likely to exist between the first and second regions and having to be withstood on the upper surface side by a junction between the second region and the substrate or by a junction between the wall and the substrate. The high voltage device further comprises a conductive track being likely to be at a high potential extending over the substrate between the second region and the wall, and a third region of the first conductivity type of a high doping level formed in the substrate under a portion of the track substantially halfway between the second region and the internal periphery of the wall, the third region being contacted by a field plate which is insulated from the track, and extends widthwise at least substantially across the track and lengthwise beyond the third region on either side of the third region in the direction of the wall and of the second region.

The assertion on page 3 of the Office Action is that Whitney's field plate 36 extends beyond the third region 35 where it becomes 31 and 34. Applicant respectfully disagrees. To begin, although Figure 2 of Whitney illustrates the second portion 36 of field plate 31 as extending over the length of the graded junction 27, there is no indication in Figure 2 of Whitney, or anywhere else in Whitney, that the field plate 31 extends beyond the third region 35 to the right. In fact, Whitney states

> One end of the field plate is mounted on and electrically connected to the substrate; **the remainder of the field plate extends over a passivating oxide layer** (30) which covers the substrate surface (29) adjacent the junction termination. (Abstract)(emphasis added)

Nowhere does Whitney teach that the field plate 31 extends widthwise at least substantially across the track and **lengthwise beyond the third region on either side of the third region in the direction of the wall and of the second region**, as claimed.

Furthermore, there is no technical reason that the field plate 31 of Whitney would extend beyond the N^+ region 35 to the right. This is because the N^+ type region is connected to first portion 34 of the field plate 31 to provide a good ohmic contact to the field plate structure, so that the potential of the field plate 31 and the potential of the substrate 21 will be essentially equivalent (page 5, lines 22-29). If the first portion 34 were to extend to the right beyond N^+ region 35, there would be no additional benefit in this regard. In other words, extending the field plate to the right of N^+ region 35 would not improve the ohmic contact of the structure, since a good ohmic contact is not formed by contacting a conductive layer to the lightly doped N-type substrate. Thus, there is no reason taught or even suggested by Whitney to have the field plate extend to the right of N^+ region 35. Thus, no combination of AAPA and Whitney, even if proper, teaches or suggests a field plate that extends widthwise at least substantially across the track and **lengthwise beyond the third region on either side of the third region in the direction of the wall and of the second region**, as claimed. For at least these reasons claim 1 distinguishes over the combination of AAPA and Whitney. Accordingly, Applicant respectfully requests that the rejection of claim 1 under 35 U.S.C. §103(a) be withdrawn.

Claims 2 and 3 depend from claim 1 and are allowable for at least the same reasons.

E. Claim 4 Distinguishes Over the Combination of Applicant's Prior Art and Whitney

Claim 4 is directed to a high voltage device formed in a region of a silicon substrate of a first conductivity type delimited by a wall of a second conductivity type. The high voltage device comprises a lower surface comprising a first region of the second conductivity type connected to the wall, and an upper surface comprising a second region of the second conductivity type. The high voltage device further comprises a conductive track extending over the silicon substrate between the second region and the wall, and a third region of the first

conductivity type having a high doping level formed in the substrate under a portion of the conductive track approximately halfway between the second region and an internal periphery of the wall. The high voltage device further comprises a field plate which is insulated from the track and extends widthwise at least substantially across the track and lengthwise on either side of the third region, beyond the third region, in the direction of the wall and of the second region, at least a portion of the field plate being in contact with the third region.

As discussed above in connection with claim 1, neither AAPA nor Whitney teach or suggest **a field plate which is insulated from the track and extends widthwise at least substantially across the track and lengthwise on either side of the third region, beyond the third region, in the direction of the wall and of the second region**, at least a portion of the field plate being in contact with the third region, as claimed. Thus, the combination of AAPA and Whitney, even if proper, does not teach or suggest the recited limitation of claim 4. Hence, claim 4 distinguishes over the combination of AAPA and Whitney, and Applicant respectfully requests that the rejection of claim 4 under 35 U.S.C. §103(a) be withdrawn.